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ABSTRACT

This chapter reviews the research on promoting healthy dietary behaviors in all youth, not just those who exhibit problems such as obesity or eating disorders. The first section of this chapter presents a rationale for addressing healthy dietary behavior with children and adolescents, on the basis of the impact of these behaviors on short- and long-term health. It is argued that dietary habits acquired in childhood place some children at risk for chronic illness later in life and the prevention of these ailments should be implemented in school health programs early in childhood. The chapter's second section presents a review of nutrition education programs that have attempted to change behaviors including preschool studies, community-based programs, school-based studies, the Class of 1989 study, and the Child and Adolescent Trial for Cardiovascular Health (CATCH). A conceptual model for health promotion that is specific to young people's dietary behaviors is presented. The chapter concludes with a list of suggestions, including the following: (1) effective nutrition education programs need to be widely disseminated; (2) the focus of nutrition education needs to broaden; and (3) role models for healthy eating behavior in the social environment should be addressed. (Contains 97 references.) (SD)

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Promoting Healthy Dietary Behaviors

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The purpose of this chapter is to review the research to date on promoting healthy dietary behaviors in youth. Healthy dietary behaviors involve the adoption and maintenance of eating patterns that include a variety of foods (U.S. Department of Agriculture [USDA], 1992) and sufficient nutrients (U.S. Department of Health and Human Services [DHHS], 1988) and yet are not excessive in calories, fat, sodium, or sugar (USDA, 1995). Therefore, this chapter is concerned with the dietary behaviors of all children and adolescents, not just young people who exhibit problems such as obesity or eating disorders. This focus was selected because of the critical role of diet in the prevention of chronic diseases and the high prevalence of less-than-optimal eating behaviors across the population.

The importance of changing dietary behaviors to promote the health of children and adolescents is reflected in *Healthy People 2000: National Health Promotion and Disease Prevention Objectives* (DHHS, 1991a). Of the 21 nutrition objectives for the year 2000, eight pertain to children and adolescents and are shown in Table 8.1. Concern for the dietary behaviors of all youth has clearly

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Table 8.1 *Healthy People 2000:* Nutrition Objectives for Children and Adolescents

- Reduce overweight to a prevalence of no more than 15% among adolescents aged 12 through 19.
- Reduce growth retardation among low-income children aged 5 and younger to less than 10%.
- Reduce dietary fat intake to an average of 30% of calories or less and average saturated fat intake to less than 10% of calories among people aged 2 and older.
- Increase to at least 50% the proportion of overweight people aged 12 and older who have adopted sound dietary practices combined with regular physical activity to attain an appropriate body weight.
- Increase calcium intake so that at least 50% of youth aged 12 through 24 consume three or more servings daily of foods rich in calcium.
- Reduce iron deficiency to less than 3% among children aged 1 through 4 and women of childbearing age.
- Increase to at least 90% the proportion of school lunch and breakfast services and child care food services with menus that are consistent with the nutrition principles in the *Dietary Guidelines for Americans.*
- Increase to at least 75% the proportion of the nation's schools that provide nutrition education from preschool through 12th grade, preferably as part of quality school health education.

SOURCE: U.S. Department of Health and Human Services, Public Health Service (1991a).

become a national priority and remains so even after reviewing progress since 1990 (DHHS, 1995b).

The first section of this chapter presents a case for the importance of addressing healthy dietary behaviors with children and adolescents, on the basis of the impact of these behaviors on short- and long-term health. The second section presents a review of nutrition education programs that have attempted to change these behaviors, a model for health promotion that is specific to young people's dietary behaviors, and a list of future research needs in this area. This review, then, not only provides evidence for the importance of the *Healthy People 2000* objectives but also provides direction on how they might best be achieved.

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The Importance of Healthy Dietary Behaviors in Youth

Impact on Short-Term and Long-Term Health

Diet is critical to health, affecting both short-term and long-term health. During childhood and adolescence, good nutrition and dietary behaviors are important to achieve full growth potential, to promote health and well-being, and to reduce risk of chronic diseases in adulthood.

Children require sufficient energy, protein, and other nutrients for growth as well as maintenance of body functions. Growth continues at a steady rate during childhood but accelerates dramatically during adolescence, creating significant increases in calories and nutrient intake needs to support the rapid growth rate and increase in lean body mass and body size (Story, 1992). During puberty, adolescents achieve the final 15% to 20% of linear height, gain 50% of their adult body weight, and accumulate up to 40% of skeletal mass (Gong & Heald, 1994). Inadequate intake of protein, energy, or certain vitamins and minerals will be reflected in slow growth rates, delayed sexual maturation, inadequate mineralization of bones, and low body reserves of micronutrients (Story, 1992; DHHS, 1988).

In addition to the impact on growth and development, children's diets are important to ensure overall health and well-being. Dietary practices affect young people's risk for a number of immediate health problems, including iron deficiency, obesity, eating disorders, undernutrition, and dental caries (Story, 1992; DHHS, 1988). Inadequate nutrition also lowers resistance to infectious diseases and may adversely affect the ability to function at peak mental and physical ability (DHHS, 1988). Recent research provides evidence that undernutrition during any period of childhood can have detrimental effects on the cognitive development of children, affecting concentration, learning, and academic achievement (Center on Hunger, Poverty, and Nutrition Policy, 1995). Undernutrition may occur among low-income children experiencing hunger and among food-restricting dieters. Short-term studies looking at the relation-

ship between omitting breakfast and cognitive performance have reported that inadequate nutrition compromises learning (Pollitt, 1995; Simeon & Grantham-McGregor, 1989). For example, Pollitt found that well-nourished children ages 9 to 11 who skipped breakfast had higher rates of inaccurate responses to problem solving. Furthermore, low-income elementary school students who participated in the School Breakfast Program showed greater improvements in standardized test scores and had reduced rates of tardiness and absences compared with children who qualified for the program but did not participate (Meyers, Sampson, Weitzman, Rogers, & Kayne, 1989).

There is also concern about long-term health because certain dietary patterns, developed in childhood and carried into adulthood, may in combination with other behavioral, genetic, or environmental factors result in an increased risk for chronic diseases, such as heart disease, osteoporosis, and some types of cancer later in life. Some of the physiological processes that lead to diet-related chronic diseases have their onset during childhood. For example, a variety of studies have indicated that the process of atherosclerosis begins in childhood (Moller, Taubert, Allen, Clark, & Lauer, 1994; DHHS, 1991b). Fatty streaks have been found in children as young as 3 and have occurred in a progressively greater proportion of children with increasing age. Intimal plaques have been found in adolescents (Moller et al., 1994).

Four of the ten leading causes of death in adults are diet-related chronic diseases: coronary heart disease, certain cancers, strokes, and diabetes (DHHS, 1988). Poor diet and sedentary activity patterns together account for at least 300,000 adult deaths each year in the United States and are second only to tobacco use as the major behavioral contributors to death (McGinnis & Foege, 1993). Like tobacco use, eating behaviors are modifiable risk factors that begin early in life. These behaviors of are particular concern because they appear to track, that is, behavior patterns learned in childhood are predictive of behaviors and risk factors later in life (discussed in more detail below). Childhood and adolescence, then, offer opportunities to influence the establishment of healthful lifelong eating patterns. Preventing or slowing chronic disease processes in childhood and adolescence could extend the years of healthy life for many Americans (DHHS, 1991b).

Tracking and Covariation of Risk Factors and Eating Behaviors

Studies have shown that physiologic risk factors for cardiovascular disease (elevated cholesterol levels and obesity) and behavioral risk factors (diets high in total fat and saturated fat and low physical activity levels) are widely prevalent among children and adolescents (Moller et al., 1994; Perry, Kelder, & Klepp, 1994b; DHHS, 1988, 1991b). There is also evidence that behavioral risk factors for cardiovascular disease and obesity track from childhood to adulthood. Kelder, Perry, Klepp, and Lytle (1994) examined the tracking of food choices and physical activity during a 6-year period for students beginning in the 6th grade and continuing through 12th grade. A clear pattern of tracking was observed; in the 6th grade, those in the highest quintile for healthy food choices or hours of exercise a week largely remained in that quintile, and the lowest remained low. This suggests that the development of healthy dietary patterns during childhood may be particularly important in the prevention of diet-related chronic diseases later in life.

Several studies have related childhood cholesterol levels to later young adult levels. Of the six major studies tracking cardiovascular disease physiological risk factors in childhood—the Muscatine Study (Lauer, Lee, & Clarke, 1988), the Bogalusa Heart Study (Freedman, Shear, Srinivasan, Webber, & Berenson, 1985), the Cincinnati Study (Laskarezewski et al., 1979), the Cittadella Study (Pagman et al., 1982), the Beaver County Study (Orchard, Donahue, Kuller, Hodge, & Drash, 1983) and the Cardiovascular Risk in Young Finns Study (Porkka, Viikari, & Akerblom, 1991)—all indicated that total cholesterol and low- and high-density lipoprotein cholesterol measurements in childhood and adolescence were predictive of adult values. This has implications for dietary behaviors in youth because dietary fat intake is associated with cholesterol measurements, and primary prevention of elevated cholesterol levels may require lower-fat dietary patterns among young people.

Tracking of weight and body mass index from childhood into the adult years is also evident, with many overweight children becoming overweight adults. Clarke and Lauer (1993) found that from 48% to 75% of children in the upper quintile of body mass index

ranked again in the upper quintiles as adults. The risk of overweight children becoming overweight adults increases with age. Serdula and colleagues (1993) reviewed 16 studies on the relationship between obesity in childhood and in adulthood and found that although 26% to 41% of obese preschool children became obese as adults, 42% to 62% of obese school-age children were obese as adults. Stunkard and Burt (1967) reported that the odds against obese 13-year-olds becoming normal-weight adults were 4:1; if they had not reduced their weight by the end of adolescence, the odds increased to 28:1.

In addition, eating behaviors do not occur in isolation from other health behaviors among children and adolescents. During the past decade, a number of studies have looked at the interrelationship (also referred to as covariation or clustering) between health behaviors among adolescents. Some of these have examined unhealthy eating behaviors, dieting, or unsafe weight loss methods and their association to other health behaviors (French, Story, Downes, Resnick, & Blum, 1995; Lytle, Kelder, Perry, & Klepp, 1995; Lytle & Roski, in press; Neumark-Sztainer, Story, & French, 1996). Lytle and Roski recently reviewed nine studies on the covariance or clustering of health behaviors in adolescents that included a measure of eating behavior. Of the nine studies, seven showed modest associations between unhealthy eating and other health-compromising behaviors. In general, the highest correlations were observed between lack of exercise and poor diet. Lytle et al. (1995) examined the relationships between a food choice score, an activity score, and smoking prevalence in a cohort of students as they moved from 6th to 12th grade. After the 8th grade, students who reported making fewer healthy food choices also had lower physical activity patterns and were more likely to smoke cigarettes.

The results from these studies on physiologic risk factors, obesity, and dietary behaviors indicate a consistent pattern of tracking from childhood and adolescence into adulthood. In addition, poor eating patterns are correlated with other health-compromising behaviors that are of concern. These data suggest that eating behaviors consolidate prior to and during adolescence and place some individuals at risk for chronic diseases in adulthood. Clearly, programs aimed at establishing healthy dietary practices, the prevention of obesity, and the primary prevention of other chronic diseases

should be implemented in childhood and adolescence. In particular, school health programs need to promote the development of a healthy lifestyle across multiple, related behaviors.

Current Dietary Intakes, Eating Patterns, and Nutrition Concerns of Youth

As the 20th century draws to a close, it is of interest to review the dietary behaviors of youth in the United States. What are U.S. children eating? Are the problems of unhealthy diet outlined above evident among youth in the United States or primarily among small subgroups?

The nutritional problems of children and adolescents have changed drastically during the past century. With the exception of iron deficiency, overt nutrient deficiencies are not public health problems today as they commonly were earlier in this century and as recently as the 1940s (DHHS, 1988). As problems of nutrient deficiency diseases and undernutrition have diminished, they have been replaced by public health problems of dietary excesses and imbalances.

National surveys show that most children do not consume a diet that meets the USDA's (1995) *Dietary Guidelines for Americans* (Kennedy & Goldberg, 1995; McDowel et al., 1994). Dietary excesses of total fat, saturated fat, and sodium are common among youth and are found in all income groups, racial/ethnic groups, and both sexes (McDowel et al., 1994). Although the level of total fat and saturated fat in the diets of all Americans has been declining since the early 1980s, current average intakes for children and adolescents (33% to 34% of calories from fat and 12% of calories from saturated fat) still exceed the recommendations of 30% of calories from fat and less than 10% of calories from saturated fat. In the Third National Health and Nutrition Examination Survey (NHANES III) data, school-age children and adolescents were more likely than other age groups to exceed the recommendations for fat and saturated fat (Lewis, Crane, Moore, & Hubbard, 1994). In the 1989-1991 USDA Continuing Survey of Food Intake by Individuals (CSFII), more than 90% of teenage boys exceeded the recommendations for total fat, saturated fat, and sodium (2,400 mg so-

dium/day; Kennedy & Goldberg, 1995). Dietary cholesterol has declined steadily across all age groups, in part because of a decline in egg consumption during the past 20 years. Now, almost 90% of children meet the dietary recommendation for cholesterol (300 mg cholesterol/day).

Dietary fiber is also low in the diets of many children and adolescents. Compared with current dietary intakes, the new fiber recommendations (age of child plus 5 grams per day for youth ages 2-18) would require a 25% to 50% increase in fiber consumption for preadolescents and a 70% to 100% increase for many adolescents (Williams, 1995). One reason for the low fiber intake is the low consumption of fruits and vegetables. Of the five major food groups, children are most likely to have an inappropriate number of servings from the fruit and vegetable group (Kennedy & Goldberg, 1995). In the national Youth Risk Behavior Surveillance Survey, 60% of adolescents reported eating no vegetables, and 40% ate no fruit on the day preceding the survey (Kann et al., 1995).

Nationally representative surveys have shown that the average intake of protein and many vitamins and minerals meets or exceeds the recommended dietary allowances (Alaimo et al., 1994; Kennedy & Goldberg, 1995). Exceptions include vitamins B_6, folate, A, and E and the minerals zinc, calcium, and iron (for adolescent girls). Given the importance of calcium and bone health in the potential prevention of osteoporosis, it is of concern that calcium intake of adolescent girls starts to decline at puberty, the time of maximal requirements. Females 12 to 19 years consume an average of only 68% of the recommended dietary allowance for calcium, making it unlikely that many will reach their full genetic potential for bone mass development (Kennedy & Goldberg, 1995).

Other nutrition-related concerns include overweight, unsafe weight-loss methods, eating disorders, low physical activity levels, and hypercholesterolemia among children and adolescents. Overweight is a major public health problem in the United States and has increased significantly in the past 30 years among children and adults. The NHANES III data indicated that 22% of children and adolescents (ages 6-18) were overweight, on the basis of a body mass index greater than the 85th percentile (Troiana, Flegal, Kuczmarski, Campbell, & Johnson, 1995). The prevalence of eating disorders ranges from 1% to 5% among adolescent girls and is

associated with serious morbidities (DHHS, 1988). Although difficult to measure and document, hunger and insufficient food resources are of concern among youth in low-income families.

In addition to changes in dietary intakes, dramatic changes have also occurred in children's and adolescents' eating patterns during the past two decades. Today, youth are eating more frequently throughout the day, obtaining a greater proportion of their energy and nutrient intake from snacks, and eating more meals away from home (Kennedy & Goldberg, 1995). According to the National Adolescent Student Health Survey, almost 90% of adolescents ate at least one snack the previous day, with one fourth eating four or more snacks. Almost two thirds of these snacks were categorized as high-fat or high-sugar foods (chips, soda, candy, ice cream, and cake; American School Health Association, 1988).

In addition, almost half of the family food expenditures (46%) are for food and beverages served outside the home, with 34% of the total food dollar spent on fast foods. Fast-food restaurants capture 83% of restaurant visits by young people under 18 years of age (DHHS, 1991a). Away-from-home eating is associated with higher calorie, fat, and saturated fat intake than at-home eating (Troiana et al., 1995). Foods most often ordered for children under age 6 at restaurants include soft drinks, hamburgers, cheeseburgers, french fries, pizza, and ice cream—foods that tend to be high in saturated fatty acids, total fat, cholesterol, and calories. These same foods plus fried chicken are among the items 6- to 17-year-olds are most likely to order (DHHS, 1991a). A shift toward eating more meals out has also contributed to decreased milk intake because milk is consumed most often at home. Only 7% of adolescents order milk in a fast-food restaurant (National Dairy Council, 1995).

Recommendations for Healthy Eating

The most recent *Dietary Guidelines for Americans* (USDA, 1995) developed by the USDA and DHHS provide a framework for healthful diets for all healthy Americans 2 years of age and older and include the following seven recommendations:

1. Eat a variety of foods.
2. Balance the food you eat with physical activity—maintain or improve your weight.

3. Choose a diet with plenty of grain products, vegetables, and fruits.
4. Choose a diet low in fat, saturated fat, and cholesterol.
5. Choose a diet moderate in sugars.
6. Choose a diet moderate in salt and sodium.
7. If you drink alcoholic beverages, do so in moderation (intended for adults only). (pp. 1-43)

These guidelines focus on the overall modifications that are needed to reduce the risk of diet-related chronic diseases. *The Food Guide Pyramid* (USDA, 1992), designed to help Americans choose foods consistent with the *Dietary Guidelines for Americans,* provides recommendations for daily servings of food (see Figure 8.1).

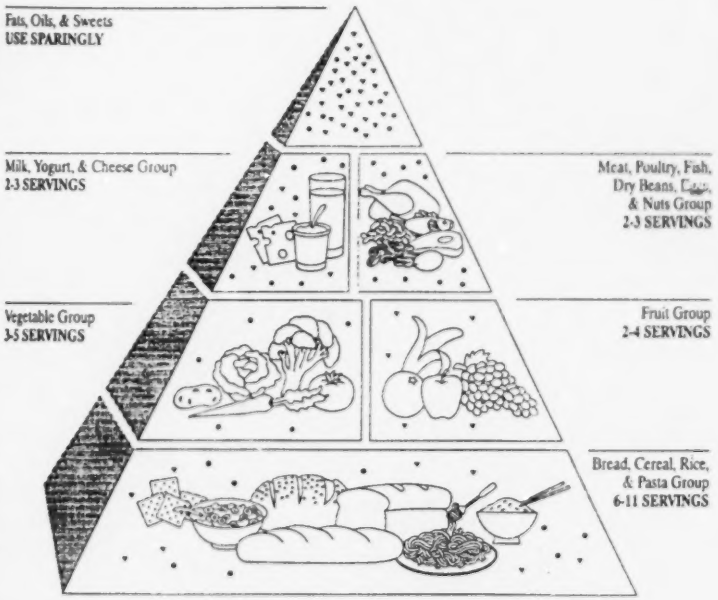

Figure 8.1. Food Guide Pyramid: A Guide to Daily Food Choices
SOURCE: U.S. Department of Agriculture (1992).

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The number of servings in each food group is expressed as a range and depends on several factors including growth status, age, gender, body size, and activity level. The lower number of servings in each food group is the minimum needed, whereas adolescents who are physically active require the larger number of servings from each group. The pyramid encourages the three basic principles of a healthful diet—variety, balance, and moderation—and is based on the concept of proportionality, that is, eating more foods from the groups at the base of the pyramid. This is best visualized by imagining a dinner plate divided into four sections: Three sections are filled with vegetables, fruits, and grains, and the fourth with a lower-fat choice from the meat/bean group. A glass of milk is added to complete the five major food groups.

Promoting Healthy Eating Behaviors Among Children and Adolescents

Given the immediate and potential health risks from poor dietary behaviors, nutrition education clearly needs as its primary goal to affect the eating behaviors of children and adolescents. Likewise, positive dietary behaviors need to be sustained, given the evidence of tracking of health behaviors in adolescence (Kelder et al., 1994), and to become part of a healthy lifestyle, given the evidence for the covariation of health behaviors among adolescents (Lytle, Kelder, Perry, & Klepp, 1995; Lytle & Roski, in press). The major outcomes of intervention should be the attainment of behavior patterns consistent with the *Dietary Guidelines* (USDA, 1995). Therefore, population-based and communitywide efforts that encourage healthful dietary behaviors among all children and adolescents are seen as optimal, with communities of color and those of lower socioeconomic status at greatest need and therefore of highest priority (Cook & Martin, 1995; Ervin & Reed, 1993; Kennedy & Goldberg, 1995; DHHS, 1988, 1995a).

The most traditional way to influence children's eating behaviors has been through nutrition education. A survey of 1,000 schools across the country showed that 99% of public schools offered nutrition education somewhere within the curriculum (U.S. Department of Education, 1996). For kindergarten through eighth grade, half or more of all schools had district or state requirements for

nutrition education. Nutrition education has been evolving during the last several decades not only to include didactic, knowledge-based nutrition information but also to include, and ideally emphasize, interventions that target the personal, socioenvironmental, and behavioral factors that influence the adoption and maintenance of eating behaviors in youth.

To date, nutrition education has used an information dissemination model emphasizing cognitive information based on nutrition science. Functions of the nutrients, food sources of nutrients, and diet and disease connections (often focusing on rarely occurring deficiency diseases such as scurvy or pellagra) have predominated the content. This knowledge-based model is often referred to as the Knowledge, Attitude, Behavior (KAB) model, which assumes that increasing cognitive knowledge about nutrition will result in positive attitudes toward choosing a healthful diet, which will eventually result in the behavior of choosing a healthful diet (Contento et al., 1995; Lytle-Trenkner & Kelder, 1991). Research findings indicate that the KAB model is effective in increasing students' knowledge of nutrition facts but unsuccessful in influencing students to choose healthful diets.

Since the mid-1980s, nutrition education has been infused with influences from the behavioral sciences. The application of behavior change theory and behaviorally based approaches to nutrition education have been tested and evaluated. Behaviorally based programs target behavior change directly through the provision of increased opportunities to try healthful foods, environmental support for healthful eating behaviors, and a variety of behavior change strategies to model, reinforce, and provide incentives for making healthful choices. Nutrition education programs that focus on behavior change, rather than knowledge acquisition, have had some solid successes in improving the diets and food choices of children.

Several comprehensive reviews of nutrition education with young people have recently been undertaken, providing insights to help guide future directions. Lytle-Trenkner and colleagues conducted reviews of school-based nutrition education programs and school food service interventions from the 1980s (Lytle, Kelder, & Snyder, 1993; Lytle-Trenkner & Kelder, 1991). Contento, Manning, and Shannon (1992) published a review with conclusions that were consistent with most of those made by Lytle-Trenkner and Kelder. In 1995, Lytle and Achterberg published conclusions based

on a review of 43 articles including in-school and out-of-school nutrition programs. Contento et al. (1995) expanded that review to include programs for preschool children. Articles were included in the above reviews if they were published since 1980 and were based in the United States. Because the last review has only recently been published, this section will provide a summary of these extensive reviews (Contento et al., 1995; Contento et al., 1992; Lytle & Achterberg, 1995; Lytle et al., 1993; Lytle-Trenkner & Kelder, 1991). The reader is encouraged to read these reviews for greater detail on specific studies.

Preschool Studies

Nutrition programs for preschool children most typically occur because of federally administered programs, such as the Special Supplemental Program for the Women, Infants, and Children (WIC) program and Head Start, and state or local day care settings and preschool programs. State and local programs often rely on materials and information provided by the Nutrition Education and Training (NET) program. WIC programs, administered by USDA, provide food supplements, health services, and nutrition education to pregnant and postpartum women, infants, and young children. The WIC program has been shown to be effective in reducing health risks of pregnant women, infants, and young children through the provision of foods and other health services (Armotrading, Probart, & Jackson, 1992; Batten, Hirshman, & Thomas, 1990; Kennedy & Gershoff, 1982; Kotelchuck, Schwarz, Anderka, & Finison, 1984; Metcoff et al., 1985). The unique benefits of the nutrition education component of WIC have not been studied in isolation from the other WIC services.

Likewise, the Head Start program, administered by USDA, also has been shown to have a positive effect on the nutritional status of preschool children through reimbursed meals and supplements provided to children of low-income families qualifying for the program. Some evaluations have been conducted to ascertain the effectiveness of the nutrition education component of Head Start and were included in the following literature review. The reader is referred to Byrd-Bredbenner, Marecic, and Bernstein (1993) for a more in-depth discussion of the Head Start program. NET was

established by Congress in 1977 to teach children, prekindergarten through 12th grade, the value of a nutritionally balanced diet through positive lunchroom experiences and through classroom curricular activities. The literature reviews referred to in the following section includes some nutrition programs that were funded by NET.

A review of the literature by Contento et al. (1995) shows that although many nutrition education programs and activities have been developed for preschool children (most under the auspices of WIC, Head Start, or the NET program), few have undergone a rigorous evaluation assessing their effectiveness. Contento and colleagues identified 23 published studies of nutrition education programs for preschool children and divided the discussion of the studies into those using a knowledge-based approach and those using a behaviorally based approach. They conclude that the KAB model was effective in increasing nutrition-related knowledge but had minimal impact on attitudes and behaviors. A behaviorally focused approach, targeting specific eating behaviors (such as choosing fruits and vegetables and choosing low-fat milk rather than whole milk), has been shown to increase food preferences. Studies with young children indicate that increased exposure to healthful foods (Birch, McPhee, Shoba, Pirok, & Steinberg, 1987; Sullivan & Birch, 1990), positive role models who taste and enjoy healthful foods (Birch, 1980), and the tone of the social interaction surrounding eating experiences (Birch, Zimmerman, & Hind, 1980) have been positive influences for healthful eating practices for young children. Using foods as incentives or rewards, however, does not result in an increase in the preferred behavior (Birch, Marlin, & Rotter, 1984). In addition, Contento et al. (1995) found that involving families with interactive home-based programs and providing hands-on food and activity-based lessons were more likely to result in positive behavior change, stressing the importance of developmentally appropriate learning activities and materials.

To summarize, nutrition programs for young children should concentrate on increasing children's exposure to healthful food through increased opportunity to taste, smell, touch, and prepare foods. Family involvement and support for the development of positive attitudes toward eating, providing opportunities to try new

foods, and providing easy access to healthful food choices are important in influencing eating behaviors for this age group.

Community-Based Programs

A limited number of studies target preschool or school-age children in settings other than school, preschool, or day care. Nader et al. (1989), Baranowski et al. (1990), and Wagner, Winett, and Walbert-Rankin (1992) developed programs for families with a goal of positively influencing children's nutrition-related behaviors and attitudes. In the Nader et al. and Baranowski et al. programs, parents and their children were invited to attend nutrition education programs in a community setting. Both studies focused on cardiovascular disease risk reduction (i.e., consumption of low-fat and low-sodium diets) and involved evening sessions. The Nader et al. study showed significant changes in behavioral and physiologic outcomes in the children. Baranowski et al. reported favorable effects for the consumption of high-fat and high-sodium foods but mixed results on other behavioral and psychosocial measures. Low participation rates and attrition were problems in both community-based studies.

Wagner et al. (1992) studied the effectiveness of a grocery store-based program using an interactive computer intervention to educate families and to guide food-purchasing decisions targeting recommendations made by the National Cancer Institute. Results indicate that the intervention had some positive effects for influencing healthful snack preference and entrée choice and for increased knowledge of children.

Although research has been published regarding nutrition education in after-school settings (Connor et al., 1986) and during summer camp experiences (Anliker, Drake, Pacholski, & Litle, 1993) for school-age children, the programs and outcome measures were knowledge based and did not report on behavioral change. After-school programs have a disadvantage in that children prefer less structured activities after school, and intact groups of children may not be available for sequential instruction. Lytle and Achterberg (1995) suggested that if nutrition programming is to be used in after-school settings, activities should include individual learning modules; nutrition activities using computer-interactive programs may be ideal.

School-Based Studies

The majority of studies examining the effectiveness of nutrition education programs on children's eating behaviors and nutrition-related health outcomes have occurred in schools. Schools are a logical place to intervene on children's nutrition practices because the vast majority of children attend school and spend 6 to 8 hours of each weekday in school. Schools provide opportunities for practicing healthful eating behaviors because more than half of students eat one meal in school, and as many as 10% of students eat two meals in school (Dwyer, 1995). In addition, schools are staffed with professionals trained in teaching children.

School-based nutrition education programs may take several forms. Nutrition education programs may (a) stand alone as isolated nutrition education units taught at the classroom level with no tie-in to other school nutrition programs (nutrition curricula); (b) include some family-based activities to link classroom content with family; (c) consist of lessons integrated into other subject areas (i.e., using nutrition-related examples in math or social science class); (d) include planned linkages between what is taught in the classroom and nutrition education activities in the school cafeteria (i.e., school cafeteria promotions for fresh fruits and vegetables occurring simultaneously with a classroom unit on increasing fruit and vegetable consumption; or (e) be part of an overall comprehensive school health program that links nutrition with other health curricula and health services in the school and includes nutrition concerns in developing a school policy to promote a healthful school environment.

The content of school-based nutrition education programs also includes a myriad of options. In 1995, the U.S. Department of Education (1996) conducted a survey of 1,000 principals in the United States to determine what topics were covered in nutrition education in their schools. Topics indicated by 90% or more of the schools participating in the survey included relationships between diet and health, finding and choosing healthy foods, nutrients and their food sources, the dietary guidelines and goals, and reading food labels. Data obtained in this survey indicate that the KAB approach to nutrition education is still quite prevalent. This emphasis on relationships between diet, health, nutrients, and food sources suggests that abstract nutrition science, rather than behav-

ioral skills, is being taught. Even curricula covering the dietary guidelines may emphasize knowledge acquisition, rather than behavior change, if the lesson focuses on what the dietary guidelines are rather than how to use them to guide food choices.

Literature reviews of nutrition programs have shown that nutrition education in schools can be effective in improving aspects of children's eating behaviors and, in some cases, can positively affect physiological outcomes such as serum cholesterol (Contento et al., 1995; Contento et al., 1992; Lytle & Achterberg, 1995; Lytle-Trenkner & Kelder, 1991). In their review of United States-based research, Lytle and Achterberg identified six elements of school nutrition programs that are critical for creating eating behavior change:

1. Programs should be behaviorally based and theory driven.
2. Family involvement should be incorporated into programs for younger children.
3. Programs for middle to senior high school students should include self-assessment of eating patterns.
4. Behavior change programs should include intervening in the school environment.
5. Behavior change programs should include intervening in the larger community.
6. Programs should include intensive instruction or intervention time.

These six elements suggest that nutrition education programs need to be guided by behavioral theories, include components that link an intensive classroom curriculum to changes in school food service, and include opportunities for healthy eating at home and in the community. Contento et al. (1995) echo those same elements as essential in effective nutrition programs.

The Centers for Disease Control and Prevention (CDC, 1996) recently published "Guidelines for School Health Programs to Promote Healthy Eating," providing a template for the development of comprehensive school nutrition programs to be used by school districts, nutrition educators, and health professionals working with school-based nutrition programs. Seven recommendations have been made (Table 8.2) that incorporate what has been learned about effective nutrition programs. These recommendations rein-

Table 8.2 Recommendations for School Health Programs Promoting Healthy Eating

1. Adopt a coordinated school nutrition policy that promotes healthy eating through classroom lessons and a supportive school environment.
2. Implement nutrition education from preschool through secondary school as part of a sequential, comprehensive school health education curriculum designed to help students adopt healthy eating behaviors.
3. Provide nutrition education through developmentally appropriate, culturally relevant, fun, participatory activities that involve social learning strategies.
4. Coordinate school food service with other components of the comprehensive school health program to reinforce messages on healthy eating.
5. Provide staff involved in nutrition education with adequate preservice and ongoing in-service training that focuses on teaching strategies for behavioral change.
6. Involve family members and the community in supporting and reinforcing nutrition education.
7. Regularly evaluate the effectiveness of the school health program in promoting healthy eating, and change the program as appropriate to increase its effectiveness.

SOURCE: Centers for Disease Control and Prevention (1996).

force the need for (a) environmental support that includes a school policy encouraging healthful options in the school, reinforcement and modeling of healthy food-related behaviors, and school and district commitment to provide adequate training and time for nutrition programming; (b) a behaviorally based nutrition curriculum that is part of a comprehensive school health program and is of adequate duration to impact behavior; and (c) the recognition of the importance of school, family, and community linkages and partnering.

To date, a comprehensive school nutrition program reflecting all the recommendations made and spanning children's entire school career has not been evaluated for effectiveness, with results published in the peer review literature. The CDC recommendations have been based on effective programs that have incorporated pieces of a comprehensive nutrition program. The Class of 1989 study and the Child and Adolescent Trial for Cardiovascular Health (CATCH) included many of the elements identified as essential for an effective nutrition education program and thereby serve as

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examples of what can be accomplished in schools to change eating behaviors of youth.

The Class of 1989 Study

The Class of 1989 study was part of the Minnesota Heart Health Program (MHHP; Blackburn et al., 1984), focusing on adolescent cardiovascular risk reduction through school and communitywide programs (Perry, Klepp, & Sillers, 1989). Two of the six MHHP communities participated in an evaluation of adolescent school-based programs, in combination with communitywide programs, to affect eating, physical activity, and smoking behaviors in a cohort of youth as they progressed from 6th through 12th grade. The Class of 1989 study used behaviorally based curricula and social learning theory to guide intervention strategies (Perry & Jessor, 1985). Nutrition-related lessons were linked to other health content areas, particularly smoking prevention and physical activity. These linkages allowed skills and knowledge related to practicing healthy lifestyles to be reinforced and emphasized across content areas. In addition, students in Class of 1989 schools were exposed to communitywide messages that affected social and cultural norms about heart healthful behaviors and environmental changes through restaurant and grocery store programs. Likewise, the students' parents and teachers were receiving the same communitywide messages as well as communitywide screening for cardiovascular risk factors and adult-centered risk factor education programs on smoking cessation, physical activity, and healthy eating patterns and interventions.

The school-based nutrition interventions occurred in 6th grade, through a one-session program designed to promote packing and eating a healthful school lunch (the Lunch Bag program) and in the 10th grade through a 10-session curriculum (Slice of Life). Slice of Life used self-assessment, modeling, experiential activities, goal setting, and peer leadership to influence healthful eating and physical activity. Physical activity interventions were linked with the nutrition-related activities in the classroom curriculum (Kelder, Perry, & Klepp, 1993; Perry et al., 1987).

As part of the evaluation, more than 1,000 students in the reference and intervention communities completed surveys for 7 consecutive school years, from their 6th through 12th grades

(1983-1989). Results from the Class of 1989 study indicate that those students exposed to the community and school-based intervention, emphasizing behaviorally based messages with school and community linkages, reported healthier food choices as compared with students in the reference community in all but a few years of the 7-year study (Kelder, Perry, Lytle, & Klepp, 1995). Likewise, students in the intervention group reported less frequently adding salt to foods as compared with students in the reference community. In addition, students in the intervention community had lower smoking rates and more positive physical activity measures compared with same-age students in the reference community (Kelder et al., 1993; Perry, Kelder, Murray, & Klepp, 1992). The outcomes from the Class of 1989 study are important because they show that behavioral health education in schools that is implemented during multiple school years and with complementary community programs can positively affect cardiovascular-related health behaviors of adolescents in the community (Perry, Kelder, & Klepp, 1994a). Generalizability of the Class of 1989 study is limited because the population was primarily Caucasian and from the north-central United States.

The Child and Adolescent Trial for Cardiovascular Health

CATCH was the largest multicenter field trial ever funded by the National Heart, Lung, and Blood Institute to evaluate school and family interventions to reduce cardiovascular risk factors in elementary school children (Luepker et al., 1996; Perry, Parcel, et al., 1992; Perry et al., 1990). More than 5,100 children from four states and 96 schools, including Caucasian, African American, and Hispanic children, participated in CATCH from their 3rd- through 5th-grade school years. The intervention was based on social learning theory with a strong behavioral emphasis. The intervention included a school environment component, 3 years of sequential, classroom-based curricula, and family involvement. The school environmental interventions included (a) modification of the school food service to reduce fat and sodium in foods offered through the school breakfast and lunch programs, (b) modification of physical activity classes to increase students' level of moderate

to vigorous physical activity during gym class, and (c) promotion of school policy to eliminate tobacco use on the school premises.

The classroom curricula included 12 to 16 sessions in third through fifth grade. Behaviors targeted in the curricula included choosing lower-fat and lower-sodium foods, choosing to engage in regular physical activity, and making the decision not to start smoking. A link was made to families through take-home activity packets completed by parent and child that complemented and expanded the classroom-based lessons. In addition, families were invited to attend a family fun night at the end of the CATCH unit in the third and fourth grades. These family fun nights included games, activities, healthful snacks, and an aerobic dance routine performed by the students.

CATCH was evaluated through a large battery of physiological, behavioral, and psychosocial measures assessing change at both the school and individual level (Luepker et al., 1996) from baseline (fall 1991), when the students were in the third grade, to follow-up (spring 1994), when the students were in the fifth grade. After three school years, intervention schools as compared with control schools had significantly reduced the fat and saturated fat content of school meals (Osganian et al., 1996) and had increased the level of moderate to vigorous physical activity and vigorous physical activity during physical education class (Luepker et al., 1996). In addition, at the student level, students in the intervention schools were consuming diets lower in total fat and saturated fat without compromising energy intake or other vitamin or mineral intake (Luepker et al., 1996; Lytle et al., 1996). The majority of the scales assessing psychosocial constructs, including knowledge, food choice, and perceived social norms, showed significant gains in the intervention group as compared with the control group (Edmundson et al., 1996). Assessment of physiological measures related to cardiovascular disease (e.g., total blood cholesterol, systolic and diastolic blood pressure, and body mass index) did not show intervention effects (Luepker et al., 1996; Webber et al., 1996).

The CATCH trial was important in showing that school-based programs involving school food service, classroom curriculum, family programs, and physical education are feasible to implement in most U.S. schools. In addition, the trial showed that the school environment could be modified without undue financial or resource hardship, that children could modify their health-related

behaviors and psychosocial factors, and that the interventions tested were generalizable across four different regional areas and across children from varied ethnic backgrounds. The elements lacking in CATCH were links to the broader community and integration within a comprehensive school health program spanning the children's school years.

Long-Term Outcomes

Studies looking at the long-term effects of youth-centered nutrition programs and interventions are rare. Little is known regarding how youth exposed to any type of nutrition program use information and acquired skills to make food choices during their adult lives. Studies considering the long-term effects, even during students' school years, indicate that the effects of successful interventions tend to dissipate through time. One-shot nutrition education units, even if they are behaviorally based and experiential, are not sufficient for a lifetime of eating-related decisions, skills, and healthful habits. Certainly, implementation of the CDC (1996) guidelines, stressing a comprehensive school health program, including a lifestyle-related message across all health content areas presented throughout children's schooling and providing an environment that models and reinforces healthful life choices, would maximize the potential for outcomes of nutrition programs.

A Conceptual Model for Child and Adolescent Eating Behavior

A conceptual model or theory is useful in understanding the mutable and immutable variables that influence eating behaviors, affect change, and lead to the solidification of healthful lifestyle habits. One of the important criteria for effective nutrition programming is the use of a behavioral model as a guide. The majority of nutrition education programs that have been successful in achieving behavior change or health outcomes have used social learning theory as the guiding conceptual model (Bandura, 1977, 1986; Baranowski, Perry, & Parcel, 1996).

Social learning theory has identified environmental, personal, and behavioral factors that are predictive of a given behavior (Bandura, 1977) and have the potential for behavior change (Baranowski

et al., 1997). To use social learning theory, the specific factors that significantly influence eating behaviors among youth need to be identified. Those factors that are also amenable to intervention serve as the primary targets for intervention (Baranowski et al., 1997; Perry, Lytle, & Kelder, 1994). Environmental factors are those aspects of the environment that support, permit, encourage, or discourage engagement in a particular behavior. They include food availability, parenting style and practices, family and peer influences, influential role models, cultural and social norms, social support, and specific opportunities. Personal factors are personality dispositions, cognitions, and affective factors that increase or decrease the likelihood of an individual engaging in a given behavior, such as personal attitudes and beliefs, self-efficacy and control, knowledge, functional meanings of food, and perceived body image. Behavioral factors affect behavior directly and include a person's behavior repertoire, behavioral intentions, reinforcements, skills, and coping responses. To successfully change eating patterns to improve nutritional health of youth, interventions should be aimed at modification of factors at each of the three levels.

An overall model for improving eating behavior of youth is shown in Figure 8.2. The goal of promoting healthy eating behavior is to achieve both short- and long-term health objectives. These health outcomes are, in part, dependent on the adoption of specific dietary behaviors, and their maintenance throughout life, that are suggested by the *Dietary Guidelines* (USDA, 1995). Changes in these dietary behaviors should be the outcomes sought and measured in nutrition education efforts. To make changes in these behaviors, specific psychosocial factors, as discussed above, need to be targeted. These are environmental, personal, and behavioral factors that have been suggested by social learning theory (Baranowski et al., 1997) and, to some extent, by research on the etiology of eating behavior (Perry et al., 1994b), although considerably more research is needed on the latter. How these psychosocial factors manifest must be evaluated for the specific intervention group prior to program development. For example, potent role models for elementary age children clearly include parents; by junior high and high school, peers rival parents in importance. Likewise, access to recommended foods may be difficult for children of low-income families and needs to be considered in program development. Finally, the type of intervention and its components

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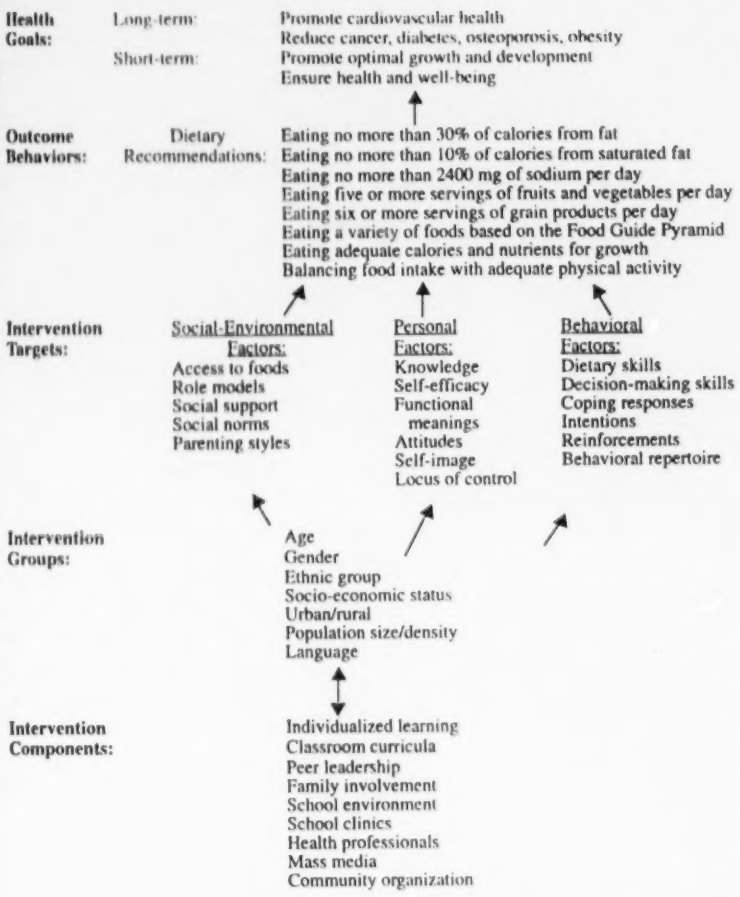

Figure 8.2. Promoting Healthy Dietary Behaviors Among Children and Adolescents: A Conceptual Model

can be addressed on the basis of what is most appropriate for the specific intervention group, what is feasible economically and politically, and what will be most influential in changing the targeted psychosocial factors. From the outcomes of intervention programs

to date, it appears that multicomponent, multiyear programs are necessary for demonstrable change. Using this model, programs to change eating behaviors among young people can be constructed, using appropriate end points, targeting key factors, and considering the special needs and opportunities of the intervention group.

Future Directions

If the linkages between psychosocial factors, which are the targets of intervention, and eating behaviors are examined, several gaps in knowledge and research are noteworthy. The following research directions, based on our conceptual model, examine these linkages and may provide new directions to improve programs to change eating behaviors among youth.

Social and environmental factors greatly affect food and eating-related behaviors. Much of the advancement in nutrition education programs during the past two decades has been in acknowledging the importance of the environment in influencing food choices and then intervening in this area. More needs to be done, however. The teaching of media literacy, which has been used in drug abuse prevention efforts (Perry & Kelder, 1992), could be applied to nutrition education. Research shows that children are a targeted market segment for food manufacturers and food distributors. Kotz and Story (1994) analyzed television advertisements aired on Saturday morning (prime-time viewing for young children) and found that more than half the advertisements were for foods that would fit into the food guide pyramid under fats, oils, and sweets. None of the advertisements were for fruits and vegetables. The important role of children as consumers is also evident in the increase in direct advertising in schools in recent years. A study by Consumers Union Education Services (1995) found that advertising for soft drinks, fast-food restaurants, candy, and chips is ubiquitous in the school environment. Children cannot even escape television advertisements in schools. *Channel 1,* a daily news program broadcast to millions of students in grades 6 through 12, includes two minutes of paid commercials of each 12-minute segment. These advertisements are for products that include candy bars, snack chips, and soda pop (Story & Neumark-Sztainer, 1996). Nutrition education needs to spend more time educating children and adolescents on

how they are influenced by the media so that they can resist advertising pressure by using the effective strategies from substance abuse prevention programs.

Another lesson to be learned from the smoking prevention and substance abuse prevention literature is to expand the use of peer leaders and peer educators in nutrition education to create positive peer influences (Komro, Perry, Veblen-Mortenson, & Williams, 1994; Perry et al., 1996). Only a limited amount of published work reports nutrition education programs that have used peer educators (Anliker et al., 1993; Perry et al., 1987). Given the importance of peers in the decisions of adolescents, more evaluated work on the use of peers as positive role models and advocates for healthy eating behaviors is needed.

Parenting style is another social-environmental influence that needs further study. Jackson, Bee-Gates, and Henriksen (1994) considered how parenting style affected initiation of smoking. Authoritative parenting has been defined as parenting skills that facilitate children's development of personal, social, and academic competencies by balancing responsiveness and control. Non-authoritative parenting was defined as excessively controlling and providing little support for children's individuation or development of autonomy. Authoritative parenting was associated with lower rates of smoking initiation, intention to smoke, and experimentation with smoking.

The association between parenting style and eating behaviors is supported by the work of Satter (1996), which suggested that excessive parental control over what and how much is consumed by their children worked against children's ability to learn to respond to natural physiological cues of hunger and satiety, placing children at risk for obesity and eating disorders. Little is known about how to positively affect parenting style to improve children's abilities and opportunities to choose healthful foods and regulate their intake in nonclinical settings.

To be able to better influence personal factors, more work needs to be done on how children learn the functional meanings of foods. Functional meanings of foods are the reasons people give for eating particular foods or for particular dietary patterns (Perry & Jessor, 1985). For example, young people may eat to stay healthy but also to have fun with friends or deal with boredom. Certainly, if parents reward children with sweets for good behavior or a good report

card, children learn that sweet foods are highly valued foods and a way to reward oneself. Likewise, if children see parents or other adult family members use food to cope with boredom, stress, or frustration, they will surely learn that eating is a way to deal with life's problems (Lytle & Achterberg, 1995). We cannot expect children to learn healthy eating and coping strategies entirely from textbooks or formal lessons; children will learn functional meanings of foods by how significant others in their physical and social environment use foods. Interventions addressing the functional meanings of foods for individuals in the junior and senior high school levels might include self-assessment of eating behaviors, highlighting not just what is consumed but cues to eating and outcome expectancies of eating.

Functional meanings of foods are also taught within the school setting when pizza coupons are used as incentives for reading and when candy bars are passed out to those completing assignments on time. Until school policy begins to address the use of food in schools for incentives and reinforcements, schools will continue to send children a mixed message that says, "Do what I say but not what I do." The functional meaning of foods in the school environment must be addressed by adopting school policies surrounding the availability and use of foods in the school environment (Story & Neumark-Sztainer, 1996).

Another personal factor that has been inadequately studied is how adolescents' need to "individuate" may influence their eating behaviors. As adolescents set out to find out who they are and try on new identities, eating behavior might be affected. There is some evidence (Donovan, Jessor, & Costa, 1993; Lytle & Roski, in press) that healthful eating behaviors are related to other healthful behaviors in youth, whereas risk-taking behaviors are related to making less healthful food choices and to eating disorders (Neumark-Sztainer, 1996). This need for individuation may explain the large number of adolescents who become vegetarian (Johnston & Haddad, 1996). The notion that individuation might affect multiple adolescent behaviors suggests that programs to promote healthy eating behaviors cannot be implemented in isolation of other social behaviors or without regard for the processes of development that are inherent to adolescence.

Finally, at the level of behavioral factors, more work needs to be done in providing students with relevant, hands-on skills for meal

planning and food preparation. With the quickening pace of U.S. society and the increasing prevalence of dual-career families, children often do not learn how to plan and prepare healthful meals. Rather, they learn how to order pizza or stop for takeout! Moreover, adolescents are increasingly responsible for preparing their own meals and snacks (Crockett & Sims, 1995). Both in school and in the family setting, children need opportunities to learn how to plan and prepare quick but healthful meals. If food classes are offered in schools, the emphasis should not be on food science applications (i.e., how to bake bread or the proper temperature for frying) but rather on simple and quick meal planning and preparation. It will be a challenge to find time in schools and in homes to teach children how to choose and prepare healthful diets. Yet it is a challenge we, as a nation, must tackle for the short- and long-term health of our children.

Healthy People 2010

In *Healthy People 2000*, eight nutrition objectives were written for children and adolescents (DHHS, 1991a; Table 8.1). The *Midcourse Review and 1995 Revisions* (DHHS, 1995b) reported notable progress in reducing growth retardation among children of low-income families and some progress in lowering fat consumption. Still, the overwhelming majority of Americans, including youth, eat a higher-fat diet and insufficient fruits and vegetables. Moreover, the prevalence of overweight has increased markedly among all age groups. For adolescents aged 12 to 19, there was a 40% increase in the prevalence of overweight in one decade. Clearly, despite explicit nutrition objectives, the introduction of the food guide pyramid, new food labels, and revised dietary guidelines, the year 2000 nutrition objectives will not, for the most part, be realized.

Although the *Healthy People 2000* document provides clear behavioral objectives, only a portion of those objectives address the question "how?" How do we, as a nation, change the dietary behaviors of children and adolescents? Without recourse to etiologic research on how eating behaviors develop and consolidate, a clearly articulated conceptual model, and successful behavioral intervention methods, it will be difficult to create a coordinated

national plan that can influence eating behaviors, particularly normative behaviors such as those contributing to a high-fat diet, insufficient fruit and vegetable intake, and overweight. Therefore, it is recommended that in *Healthy People 2010*, greater attention be paid to the conditions, environments, and policies that can support and sustain healthier choices among young people. The answer to the question, "how," thereby, should be evident in the objectives themselves.

First, nutrition education programs that have been successful in research trials need to be widely disseminated. As noted in the chapter, several school-based programs for children have demonstrated significant behavioral changes. Likewise, school food service interventions have been able to make changes in the content of foods that are served at school, and those changes were associated with healthier dietary behaviors among the students (Luepker et al., 1996). Yet monies to systematically implement these programs in schools are limited. Getting what "works" broader and sustained national support should therefore be a priority.

Second, the focus of nutrition education needs to broaden. Eating behaviors do not occur in isolation of other social behaviors of young people. In particular, poorer eating behaviors and less physical activity co-occur. Nutrition objectives need to be considered within the context of the promotion of a healthy lifestyle for youth. For example, engaging in both daily physical activity and healthy eating behaviors are necessary to reverse the trend of increasing overweight and obesity among America's young people. This implies that more time should be devoted within schools to both these behaviors and more opportunities created outside school for healthier convenience foods, snacks, and recreational activities.

Finally, the norms, opportunities, and role models for healthy eating behavior in the larger social environment should be conscientiously addressed. It is clear that when behavioral education in classrooms is complemented by school food service changes, parental involvement, and communitywide change, healthier eating behaviors among young people are more likely to be sustained. Moreover, the media messages, available convenience foods, restaurant offerings, and even grocery store promotions and environments should be considered as necessary targets in developing healthier dietary behaviors with youth. By turning attention in *Healthy People 2010* from individual behavior to the social envi-

ronment that supports behavior, the objectives for the next century would be consistent with the research to date on what factors most powerfully influence young people's behavior as well as what is effective in changing their eating behaviors. This larger concern is also consistent with the ambitious aims and intent of a national strategy for significantly improving the health of all Americans. It is not too soon to begin to talk about "how" if we want to make a difference in the health of our nation's children.

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